USH2A gene

usherin

Normal Function

The *USH2A* gene provides instructions for making a protein called usherin. Usherin is an important component of basement membranes, which are thin, sheet-like structures that separate and support cells in many tissues. Usherin is found in basement membranes in the inner ear and in the retina, which is the layer of light-sensitive tissue at the back of the eye. Although the function of usherin has not been well established, studies suggest that it is part of a group of proteins (a protein complex) that plays an important role in the development and maintenance of cells in the inner ear and retina. The protein complex may also be involved in the function of synapses, which are junctions between nerve cells where cell-to-cell communication occurs.

Health Conditions Related to Genetic Changes

retinitis pigmentosa

Several dozen mutations in the *USH2A* gene have been reported to cause retinitis pigmentosa, a vision disorder that causes the light-sensing cells of the retina to gradually deteriorate. *USH2A* gene mutations are the most common cause of the autosomal recessive form of retinitis pigmentosa, accounting for 10 to 15 percent of all cases. This form of the disorder is described as nonsyndromic, which means that it is not associated with other signs and symptoms as part of a genetic syndrome (such as Usher syndrome, described below).

The *USH2A* gene mutations that cause retinitis pigmentosa change single protein building blocks (amino acids) in the usherin protein. Through a mechanism that is not well understood, these genetic changes lead to the gradual breakdown of specialized light receptor cells called photoreceptors in the retina. A loss of these cells underlies the progressive vision loss characteristic of this condition.

Usher syndrome

More than 400 mutations in the *USH2A* gene have been identified in people with Usher syndrome type II, which is characterized by a combination of hearing loss and vision loss associated with retinitis pigmentosa. Specifically, *USH2A* gene mutations cause a form of the disorder known as Usher syndrome type IIA (USH2A), which accounts for more than half of all cases of Usher syndrome type II.

Several of these mutations change single amino acids in the usherin protein. These mutations often lead to the production of an abnormally short version of the protein

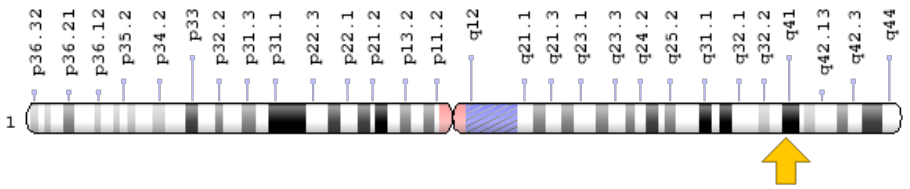
or prevent the cell from making any functional usherin. Other mutations insert or delete small amounts of DNA in the *USH2A* gene, which probably impairs the normal function of usherin. Researchers have not determined how a missing or altered usherin protein leads to the hearing impairment and vision loss that are characteristic of Usher syndrome type IIA.

It is unclear why some *USH2A* gene mutations result in Usher syndrome type IIA, while other mutations cause retinitis pigmentosa without hearing loss.

Chromosomal Location

Cytogenetic Location: 1q41, which is the long (q) arm of chromosome 1 at position 41

Molecular Location: base pairs 215,622,894 to 216,423,396 on chromosome 1 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- US2
- USH2
- USH2A_HUMAN
- Usher syndrome 2A (autosomal recessive, mild)

Additional Information & Resources

Educational Resources

- Neuroscience (second edition, 2001): The Retina
  https://www.ncbi.nlm.nih.gov/books/NBK10885/

GeneReviews

- Nonsyndromic Retinitis Pigmentosa Overview
  https://www.ncbi.nlm.nih.gov/books/NBK1417
- Usher Syndrome Type II
  https://www.ncbi.nlm.nih.gov/books/NBK1341

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28USH2A%5BTIAB%5D%29+OR+%28Usher+syndrome+2A%5BTIAB%5D%29+OR+%28usherin%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D

OMIM

- USH2A GENE
  http://omim.org/entry/608400

Research Resources

- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=USH2A%5Bgene%5D
- Hereditary Hearing Loss Homepage
  http://hereditaryhearingloss.org/
- HGNC Gene Family: Fibronectin type III domain containing
  http://www.genenames.org/cgi-bin/genefamilies/set/555
- HGNC Gene Family: USH2 complex
  http://www.genenames.org/cgi-bin/genefamilies/set/1244
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=12601
- Leiden Open Variation Database: USH2A Gene Mutations
  https://research.cchmc.org/LOVD2/home.php?select_db=USH2A
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/7399
- RetNet: Summaries of Genes and Loci Causing Retinal Diseases: USH2A
  https://sph.uth.edu/retnet/disease.htm#01.205d
- UniProt
  http://www.uniprot.org/uniprot/O75445

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